

IKONOS Spatial Quality Assessment 2000-2002

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Description

Compare spatial quality of IKONOS over 2 year period

Use near-anniversary date imagery of an urban area

Compare image gradients

- Easting and Northing

Normalize Radiometry

Select one date as reference

Adjust DN mean and variance to reference

Accounts for differences in:

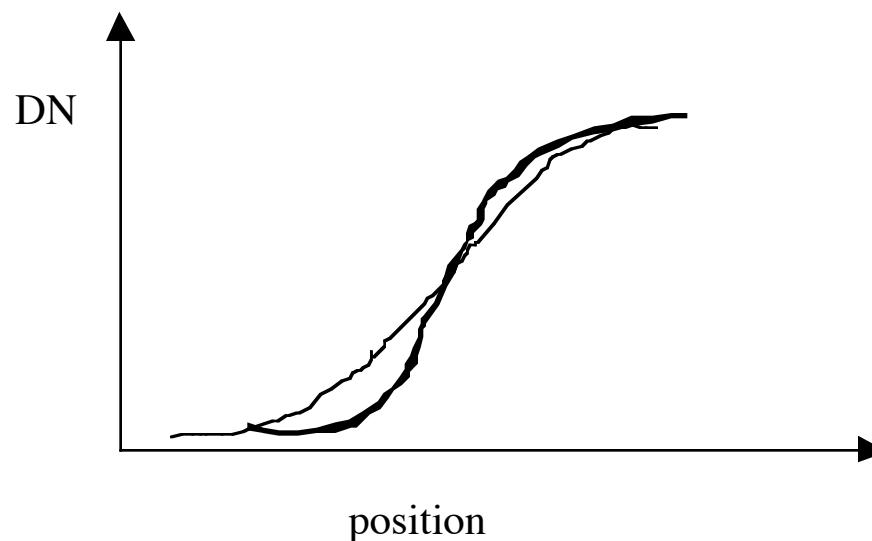
- solar elevation
- atmospheric haze, transmittance

Does *not* account for differences in

- shadow geometry
- sensor view angles
- local temporal changes (re-paving, re-roofing, new construction)

Image Gradient Measures Edge Sharpness

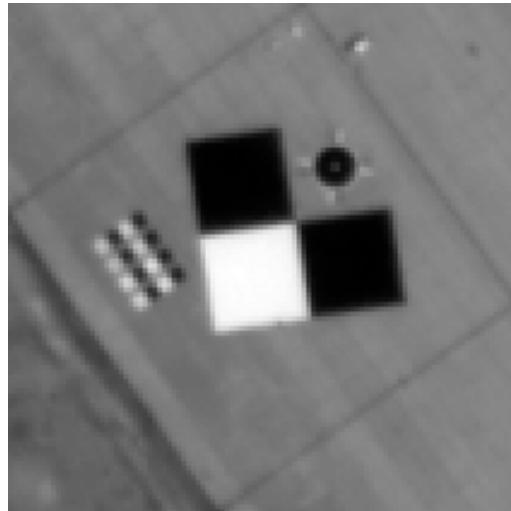
Sharper image (bold line) compared to less sharp image (thin line)



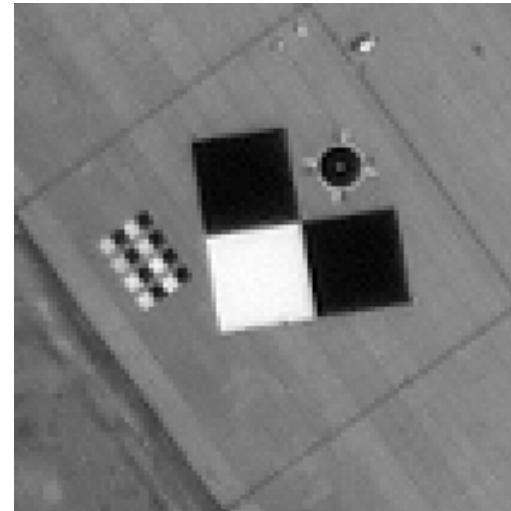
Validation of Gradient as Quality Metric

Big Spring, Texas, edge target

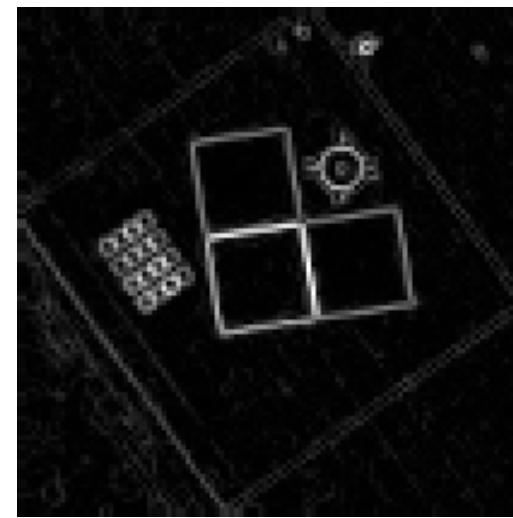
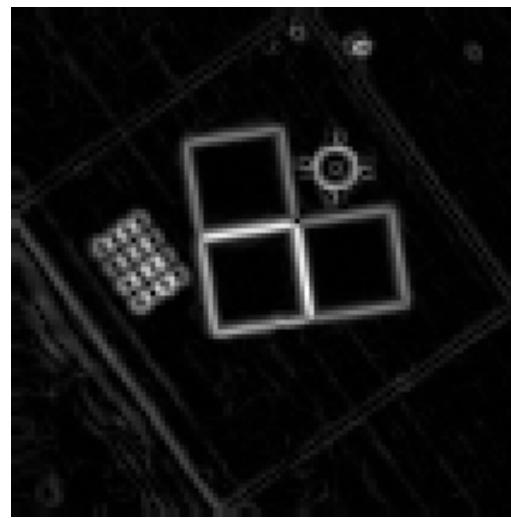
without MTFc



with MTFc



gradient images



Gradient Results for MTFc-off/on

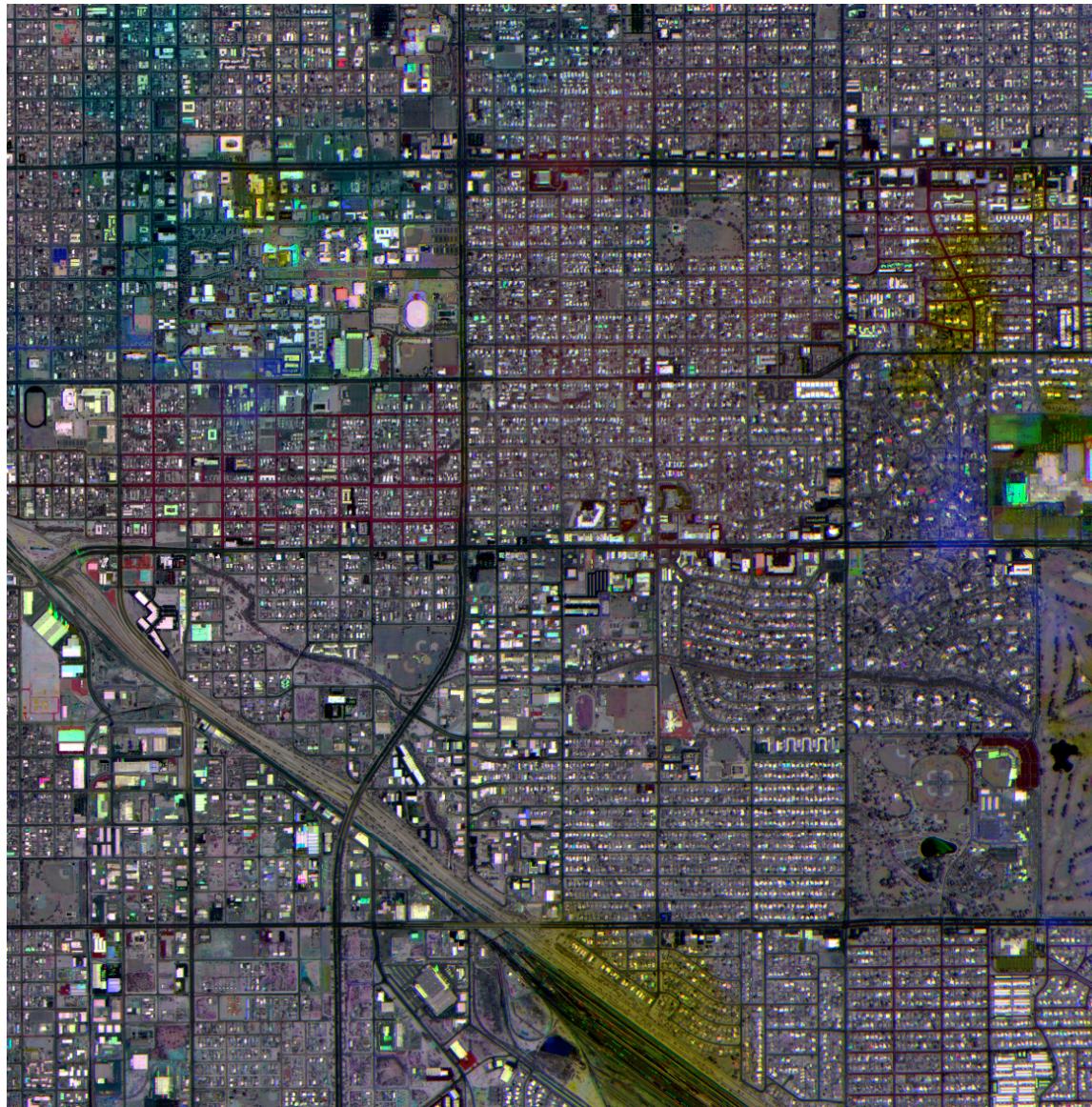
location	processing	average DN gradient magnitude	average % difference
Tucson, Arizona	MTFc-off	60.97	31.8
	MTFc-on	80.38	
Big Spring, Texas target	MTFc-off	54.2	44.3
	MTFc-on	78.2	

Image Datasets

date	solar azimuth (°)	solar elevation (°)	sensor azimuth (°)	sensor elevation (°)	MTFc	resampling	product
2000.07.23	113.8	65.4	136.1	84.2	yes	bicubic	std original
2001.07.15	117.7	70.2	276.8	84.1	yes	bicubic	std original
2002.08.03	125	67.1	71.4	69.1	yes	bicubic	std original

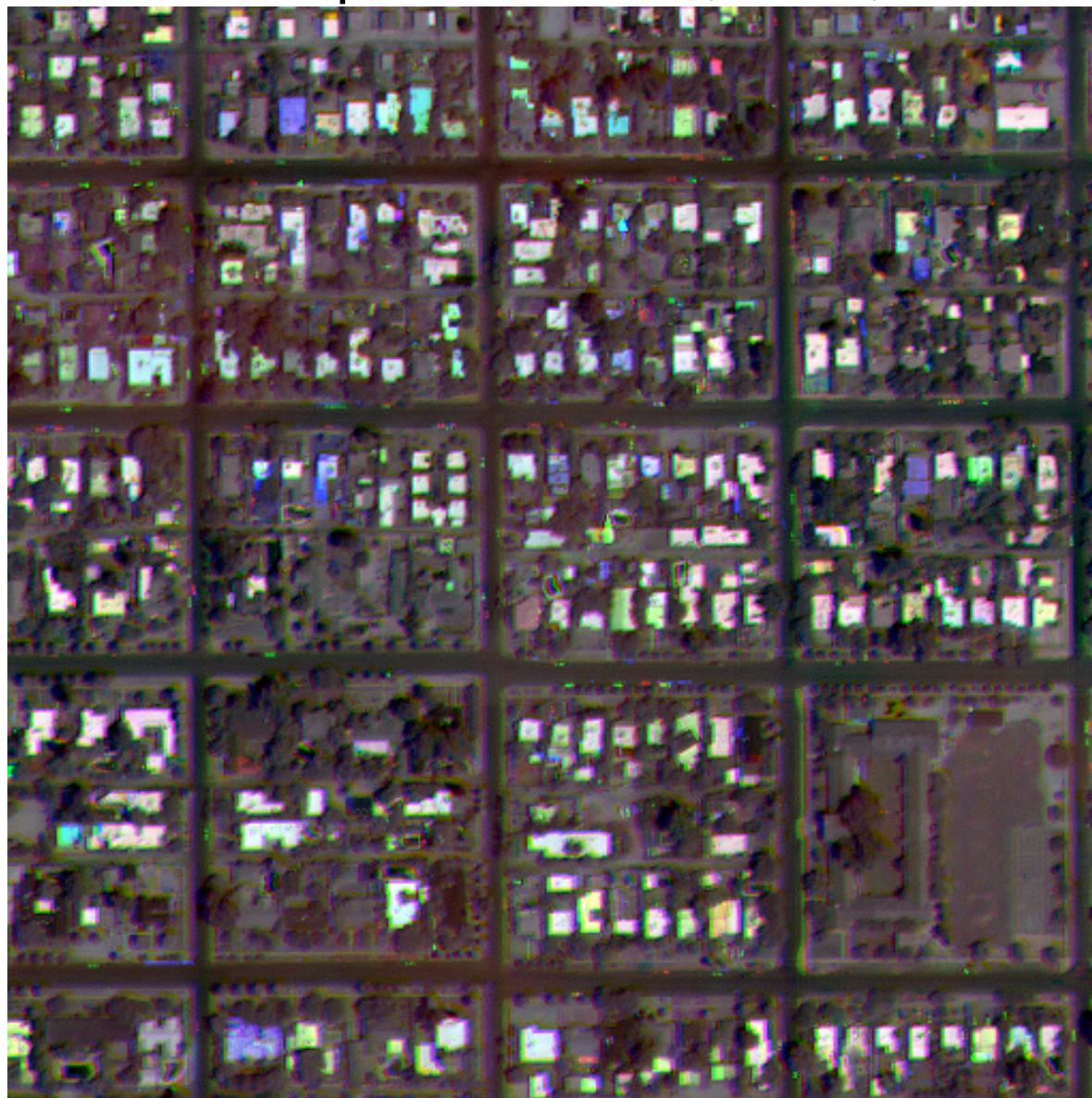
Finding Cloud-Free Areas

RGB composite of 2000, 2001, 2002



Local Temporal Changes

RGB composite of 2000, 2001, 2002



Average Gradient Magnitudes

date	area 1 (residential) 499x406 pixels	area 2 (road/industrial) 424x451 pixels
2000.07.23	167.2	129.7
2001.07.15	159.5	118.1
2002.08.03	in progress	in progress

Conclusions and Acknowledgements

Small change in image sharpness 2000-2001

- Less than 10% decrease
- Reliability being tested

2002 imagery undergoing analysis

- Visual quality comparable to earlier imagery

Acknowledgement

- NASA Grant NAG13-02044 *Radiometric and Spatial Characterization of High-Spatial Resolution Sensors*